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ABSTRACT

Twenty-four learning disabled children (ages 8 to 12) were given tests of memory and selective attention in order to highlight the similarities and differences between the two. Ss were found to be sensitive to interfering stimuli especially when the task tapped areas of their weakness. Users of effective cognitive strategies in one type of task also tended to do well on other types of tasks, but memory and selective attention should be considered distinct processes. Altering performance by increasing time salience or teaching strategies can occur, but the processes are complex. (Author/CL)

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Anne P. Copeland

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Memory and Selective Attention in Learning Disabled Children

The existence of attentional deficits in learning disabled (LD) children has been the focus of much recent research (see Douglas and Peters, 1979; Hallahan and Reeve, 1980; for reviews). Use of such strategies as verbal rehearsal or chunking is thought to be lacking, resulting in poor performance on tasks of vigilance and selective attention. The degree to which poor memory (as opposed to poor attention) strategies account for decreases in performance has been initially explored by Copeland and Wisniewski (1981), but the distinction between memory and selective attention has been methodologically muddy in much research. The current study explored the following hypotheses:

I. LD children will demonstrate difficulty in selective attention tasks even if there is no memory component to the task.
   a. Particular difficulty will be shown when the task involves areas of weakness related to their learning disability, i.e. spatial perception.
   b. Younger children will perform less well on selective attention and memory tasks than older children.

II. While attention and memory skills are distinct from each other, effective strategy use in solving selective attention tasks will be related to the use of similar strategies in memory tasks.

III. Strategy use deficits will be heightened for LD children by perceived outside stresses, i.e. the conspicuous use of salient time pressure.

IV. Teaching a focusing strategy will improve LD children's performance on a selective attention task. This will be especially

true for the younger children who, unlike the older ones, may not have used the strategy spontaneously.

Method

Subjects

Twenty LD boys and four LD girls participated in the study. Their mean age was 123.3 months (range = 100 to 146). The children were all of at least average intelligence, were at least one year behind expected age level in reading and/or math, and had been thoroughly screened on an LD battery of linguistic and perceptual tests.

Procedure

In two separate sessions each child was individually administered these three tasks:

1) The Central-Incidental Learning task (Hagen, 1967). The children's "Central memory" is assessed by asking them to remember the serial position of seven pictures. Each picture consists of two drawings, an animal and a household object. The animal is consistently the stimulus tested, never the household object. After 14 such trials, the children's "Incidental learning" was assessed by asking them to match each animal to the household object with which it had appeared on the picture. The children's selective attention index was defined as the percentage of Central memory trials successfully performed minus the percentage of Incidental information learned (%C-%I). This task is commonly considered a selective attention measure (Hallahan and Reeve, 1980), but clearly it involves a major memory component as well.

2) The Speeded Classification task (Strutt, Anderson, and Well, 1975). Children sorted decks of cards into two piles according to some

critical dimension. Either zero, one, or two types of "irrelevant information" were also on each card, to be ignored during sorting. The critical dimensions were: 1) triangles "pointing" up vs. down, 2) red vs. black triangles, and 3) one vs. four triangles. Both time needed to sort and errors were recorded. Memory plays very little or no role in this task.

The children were randomly assigned to one of two Strategy Use conditions for this task. Half were instructed to say aloud the value of the critical dimension on each card (e.g. "black, red, black"); all children complied. The other half were given no special instructions.

3) A Word List Recall task. Two lists of 20 words, each made up of five members of four semantic categories (in a scrambled order) were presented visually and orally. After a one-minute delay, children were asked to recall the words. The instructions for the second list included an admonition to act quickly, and the experimenter conspicuously used a bright yellow stop watch throughout the task. Time pressures were not made salient in the first list trial.

In all three tasks, care was taken to counterbalance the order of presentation of test stimuli.

Results and Discussion

Analysis of variance (in some cases with repeated measures) was used to examine across-condition differences. Partial correlations extracting age were used in comparisons of measures. No sex differences were found so the boys' and girls' data were pooled.

Hypothesis I. Increased amounts of irrelevant information on the Speeded Classification task did result in poorer performance, confirming this first hypothesis, $F(2,40) = 5.24$, $p < .01$. Having two pieces of irrelevant information on the deck resulted in the slowest sorting ($p < .025$),

while having no information to be ignored yielded the fastest sorting ($p < .001$).

Hypothesis Ia. As predicted, the type of critical dimension on the Speeded Classification task influenced children's sorting time, F (2,40) = 32.15, $p < .001$ and number of errors, F (2,40 = 4.07, $p < .025$. Discriminating the direction of the triangle was the most difficult for these children ($p < .001$).

Hypothesis Ib. Limited support was found concerning the age hypothesis. On the Speeded Classification task, younger children did tend to sort more slowly than older children when the critical dimensions were number, F (1,20) = 4.00, $p < .06$, or color, F (1,20) = 4.53, $p < .05$, though not when direction of triangle was critical.

This hypothesis was also examined with the Central-Incidental learning task. While younger children did tend to learn fewer Central memory items, F (1,22) = 3.72, $p < .07$, actual measures of selective attention were not significantly related to age, F 91,22)< 1, n.5.

Hypothesis II. In general, the findings support the prediction that children who use effective strategies for solving memory problems use similarly effective strategies on attention tasks, even though the processes are distinct. Specifically, central memory of items in the recency (sixth and seventh) positions was related to sorting time, $r = -.76$, $df = 11$, $p < .001$, and sorting errors, $r = -.63$, $df = 11$, $p < .01$. That is, children who were skillful at sorting decks quickly and accurately showed better memory in the serial recall task.

In contrast, however, memory of items in the middle (third to fifth) serial positions, where memory is thought to be most difficult, was positively related to sorting errors on the Speeded Classification task,

$r = .63$, $df = 11$, $p < .01$. That is, accurate sorters remembered fewer items in middle-position serial recall. It seems that when memory capacity is strained, the similarity in process to that of attention is diminished.

Further evidence concerning this hypothesis was sought by comparing the relative performance on these two attention tasks (one of which, the Central-Incidental learning task, contained a memory component) with that on the word recall task. Evidence of using a memory strategy on this latter task was defined as the number of words recalled from the beginning of the list (rehearsal strategy) or the number of words recalled sequentially within a semantic category (chunking strategy). As such, rehearsal on the word recall task was related to Central memory, $r = .58$, $df = 11$, $p < .02$. Thus, children who could selectively attend to the pertinent information on the one task were the same ones who used efficient memory strategies in word recall. Confirming the distinction between attention and memory, on the other hand, were the findings that more classification errors were made by children who, on the word recall task, rehearsed ($r = .58$, $df = 11$, $p < .02$) and chunked ($r = .56$, $df = 11$, $p < .02$) more.

Hypothesis III. Performance on the timed and untimed word recall trials were significantly correlated with each other, $r = .59$, $df = 11$, $p < .02$, and there was no significant difference between the conditions in total number of words recalled, $F(1,23) < 1$, n.s. Interestingly, however, use of a rehearsal strategy occurred more often under time pressure, $F(1,23) = 22.71$, $p < .001$, contrary to prediction. Apparently the salience of the timing acted as a motivator instead of a stressor; this finding supports a suggestion that strategy use deficits can be

altered by manipulating motivation in LD children.

Hypothesis IV. While it was predicted that younger children would be particularly helped by having been instructed to use a focusing strategy on the Speeded Classification task, in fact the opposite was found. On the most difficult type of deck (i.e. those with two pieces of irrelevant information on them), a significant age x strategy use interaction was found, F (1,20) = 5.48, $p < .03$. The younger children who had been taught the focusing strategy made the most errors (M = 2.83) while the younger children who had not received the strategy instruction made the fewest errors (M = 0.33). The older children were not significantly affected by the instruction (strategy instruction group M = 0.71, no instruction group M = 1.40). Such an instruction appears to have interfered with or made no difference on their performance, and younger children were less able to overcome the interference.

Conclusion. Some of the subtleties of the attention deficits of LD children have been illustrated by these data. They are sensitive to interfering stimuli and do have trouble ignoring them, especially when the task taps an area of their weakness. Altering performance by increasing time salience or teaching strategies can occur, but the processes are complex.

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